



Engineering Governance and Regulation in the Era of Digital Networks and Smart Technologies

Reflections towards Uganda's Vision 2040

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Presentation Outline

1 Uganda Vision 2040 & Digital Transformation	2 Digital Networks & Smart Technologies	3 Engineering Governance & Regulation
4 Case Study: Satellite IoT	5 Role of Stakeholders	6 Conclusion



Uganda Vision 2040 & Digital Transformation Context

National policy frameworks driving the transition from a peasant to a modern and prosperous society.



Uganda Vision 2040: “A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years.”



National Broadband Policy (2018): Broadband is a foundational public utility like transport and electricity.



NDP III (2020/21–2024/25): Digital Transformation Programme to increase ICT penetration and online services.



NDP IV (2025/26–2029/30): ICT framed as an enabler for all sectors to improve productivity.



Digital Uganda Vision 2040: Long-term direction for a digitally enabled society.



Uganda Digital Transformation Roadmap: Implementation pathway toward Digital Uganda Vision 2040



Digital Networks and Smart Technologies

The core components of Uganda's evolving digital landscape and sectoral systems.

Expansion of **national broadband infrastructure** including fibre, mobile, and

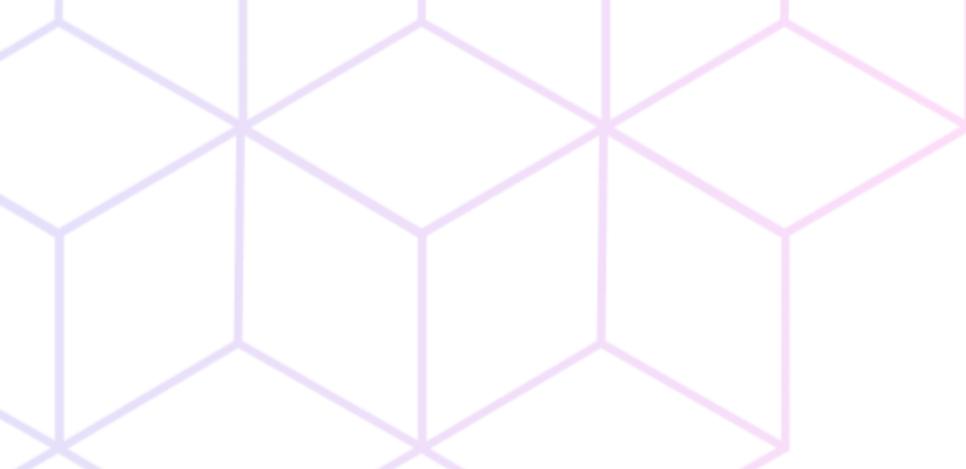
Growth of **digital public infrastructure** such as e-government platforms and

Rapid adoption of **mobile financial services** and digital payments.

Deployment of **smart sectoral systems** in agriculture, health, energy,

Increasing integration of **IoT, cloud computing**, and data-driven

Rising dependence on **secure, reliable, and interoperable**



Engineering Governance &

Balancing technical integrity with legal frameworks to create an enabling environment for sustainable innovation.

1 Engineering Governance



Structured application of engineering principles and standards to ensure safe, reliable, and sustainable systems. E.g., Spectrum planning and application of technical standards

2 Regulation



Legal/technical framework establishing rules, allocating shared resources, and enforcing compliance. E.g., Licensing, Spectrum allocation, and Quality of Service Obligations.

3 Key Distinctions



Governance ensures technical integrity and manages how systems work while Regulation ensures equitable access accountability and socio-economic benefit.

Real-World Application

How do engineering governance and regulation operate in real-world digital networks and smart technologies?



Internet of Things Use Cases

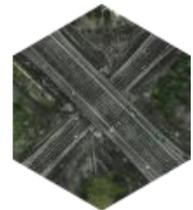
IoT systems can be provided terrestrially or via Satellite to support critical sectors.



Agriculture 🌿 Smart irrigation systems ☁️ Soil moisture & climate sensors 🚜 Precision farming & automated equipment 🐄 Livestock tracking & health monitoring 🌿 Crop disease detection



Energy & Utilities ⚡ Smart meters (electricity, water, gas) 🌞 Smart grid monitoring ☀️ Solar plant performance monitoring 💧 Water pipeline leak detection 🏭 Industrial energy efficiency



Infrastructure & Smart Cities 🌉 Bridge structural health monitoring 🏢 Smart building automation 🚦 Smart street lighting 🗑️ Waste management optimisation 📷 Urban surveillance



Oil, Gas & Mining 🛠️ Equipment health monitoring 🛢️ Pipeline leak detection 📶 Remote site connectivity 🛡️ Worker safety monitoring



Transport & Logistics 📦 Real-time cargo tracking 🚚 Fleet management systems 🌡️ Cold-chain monitoring for perishables 🚦 Intelligent traffic management ⛽ Fuel consumption optimisation



Environment & climate 🌍 Air quality monitoring 🌊 Flood early warning systems 🏔️ Landslide detection sensors 🌡️ Climate data monitoring stations 🌲 Forest fire detection systems



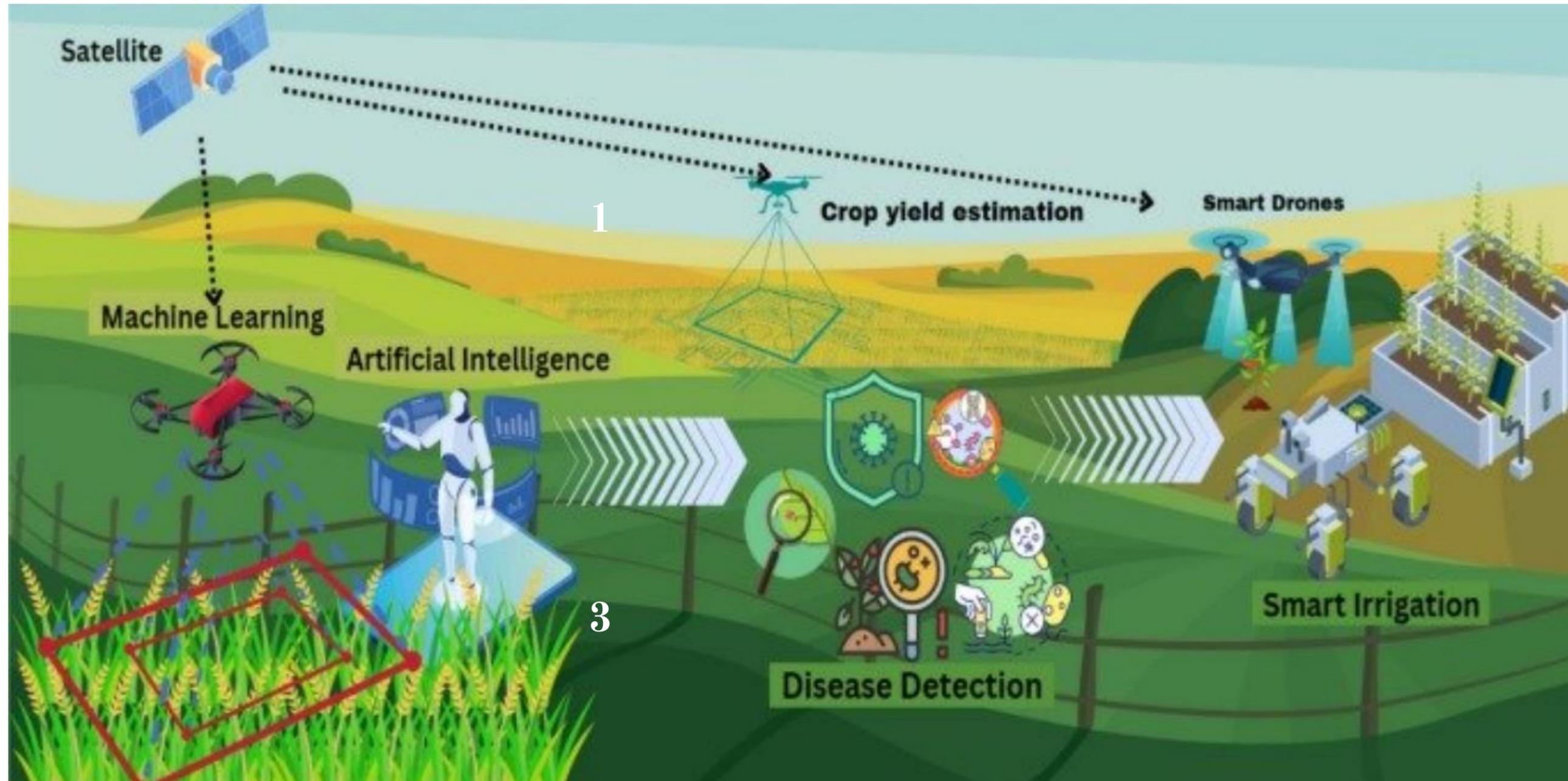
Finance & Retail 🏪 Smart POS systems 📦 Inventory tracking 🚚 Automated supply chain systems



Health & Emergency Services 🛡️ Remote patient monitoring 🚑 Ambulance tracking systems 📶 Emergency response coordination 🏥 Medical cold-chain monitoring

Satellite IoT in Smart Agriculture

A visualization of interconnected sensors, cameras, and irrigation systems.





Satellite IoT for Smart Agriculture

Technical and regulatory requirements for remote agricultural connectivity beyond terrestrial coverage.

1 Engineering Governance

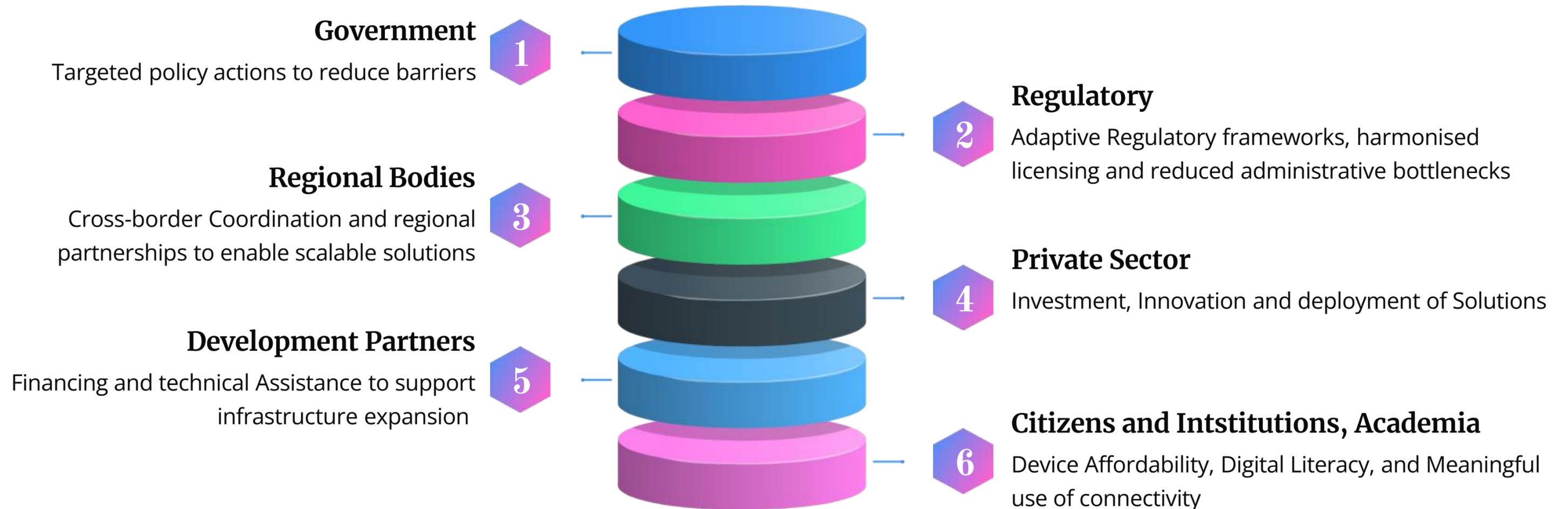
- System Engineering and Reliability (end-to-end architecture, reliability targets, redundancy, failover planning)
- RF Engineering Integrity (link budgets, antenna characteristics, power control and duty cycles, interference susceptibility)
- Standards and conformance (Radio Standards as applicable e.g. 3gpp NTN)
- Safety and EMF compliance (RF exposure assessment consistent with ICNIRP)
- Operational governance (Incident management and service continuity procedures, maintenance life cycle management, monitoring/telemetry for performance anomalies)

2 Regulatory Framework

- Service authorisation model
- Spectrum Authorisation
- ITU Radio Regulations Compliance and Coordination obligation
- Earth Station/gateway authorisation
- Type Approval and Device Conformity (terminal regulation)
- Interference Management Obligations and Enforcement
- Quality of Service and consumer/public-interest protections
- Licensing fees, administrative simplification and market entry
- Data governance

Stakeholder Ecosystem for Sustainable Digital Transformation

Unlocking the benefits of digital networks and smart technologies requires coordinated action across the ecosystem





Conclusion

Uganda's digital future will not be defined only by how fast we innovate but by how responsibly we engineer, govern, and sustain that innovation.

Uganda Vision 2040 envisions a modern and prosperous society

Digital networks and smart technologies are central to achieving transformation

As systems become more interconnected and data-driven, engineering complexity increases

Satellite IoT and emerging technologies require adaptive regulatory frameworks

Sustainable digital transformation depends on coordinated stakeholder ecosystems

Engineers are custodians of technical integrity, resilience, and public interest

Thank You

Let us ensure digital transformation delivers lasting socio-economic value!

